

CLAIMS:

1. Method for freeze-drying products making use of a chamber (1) with placement surfaces (2), whose temperature can be regulated and condensation surfaces (5), in which water issuing from the product in form of water vapor precipitates on the surface of the condensation areas and in which during the course of the freeze-drying process measurements are taken for documentation and control of the process, wherein these measurements include on-going ascertainment of the water vapor flow between the product and the condensation areas (5) as well as partial water vapor measurements, characterized in that the water vapor flows are ascertained from the on-going measurements of the partial water vapor pressure and the flow resistance for the water vapor between the placement surfaces and the condensation surfaces (5) and that the water volume issued from the product in form of water vapor is calculated via temporal integration of the water vapor flow.

2. Method according to claim 1, characterized in that the flow resistance in a freeze-drying facility is measured once each for different pressures and that these values are stored and that ascertainment of the water vapor flow takes place dependent upon pressure.

3. Method according to claim 1 or 2, characterized in that the partial water vapor pressure is frequently measured, preferably 10 to 100 times per second.

4. Method according to one of claims 1 to 3, characterized in that an instrument (15) is employed which utilizes the hydrogen absorption bands in the infra-red spectral range.

5. Method according to claim 4, characterized in that the temperature of the measuring instrument (15) is adjusted to a certain pre-determined temperature.

6. Method according to claim 4 or 5, characterized in that a temperature dependency of the measuring instrument (15) is recorded and stored in the computer (17) and that the supplied measuring values are respectively converted to a constant temperature.

7. Method according to one of the preceding claims, characterized in that a control unit (19) is assigned to the computer (17) and that the freeze-drying process is controlled on the basis of values ascertained by the computer (17).

8. Device for freeze-drying products making use of a chamber (1) with placement surfaces (2) whose temperature can be controlled and condensation surfaces (5) in which water issuing from the product in form of water vapor precipitates on the surface of the condensation surfaces and in which, during the
5 course of the freeze-drying process, measurements are taken for documentation and control of the process, characterized in that it is equipped with a measuring instrument (15) for on-going measurement of the partial water vapor pressure and that a computer (17) is provided with the aid of which the water vapor flow is calculated from the current measurements of the partial water vapor pressure and of the flow
10 resistance of the water vapor between the placement surfaces (2) and the condensation surfaces (5) and, furthermore, a calculation is done by temporal integration of the water volume which issues from the product.

9. Device according to claim 8, characterized in that the measuring instrument (15) is arranged within the freeze-drying chamber (1) namely at a location where the flow velocity of the water vapor is small relative to the sound velocity.

10. Device according to claim 8 or 9, characterized in that screening sheets (16) preferably temperature-controllable, are assigned to the measuring instrument (15).

11. Device according to one of claims 8 to 10, characterized in that screening units (21) are located between the placement surfaces (2) and at least a part of the interior chamber surfaces.

12. Device according to one of claims 8 to 11, characterized in that the placement surfaces (2) and the condensation surfaces (5) are respectively located in a chamber (1) or (4), wherein the two chambers (1, 4) are connected with each other via an opening (10).

13. Device according to claim 12, characterized in that opening (10) is assigned a valve (11) activatable on the side of the condenser, with a valve plate (12), preferably arched in the direction of the freeze-drying chamber (1).

14. Device according to one of claims 8 to 13, characterized in that a displacement body is located in the area of the condensation surfaces (5) whose diameter increases in flow direction in accordance with the decrease of the vapor volume.

15. Device according to one of claims 12 to 14, characterized in that the opening (10) is designed extending length-wise, for example in form of a slit.

16. Device according to one of claims 8 to 11, characterized in that the condensation surfaces (5) are located in the freeze-drying chamber (1).

17. Device according to claim 16 and claim 10, characterized in that the condensation surfaces (5) are located within the screening units (21, 29).

18. Device according to one of claims 8 to 17, characterized in that a control instrument (19) is provided, which controls, at least in part, the freeze-drying process taking place inside the chamber (1) on the basis of signals delivered by the computer (17).